

Hazmat Storage – 101

2007 Joint MAJCOM HMMP Workshop

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What we'll cover...



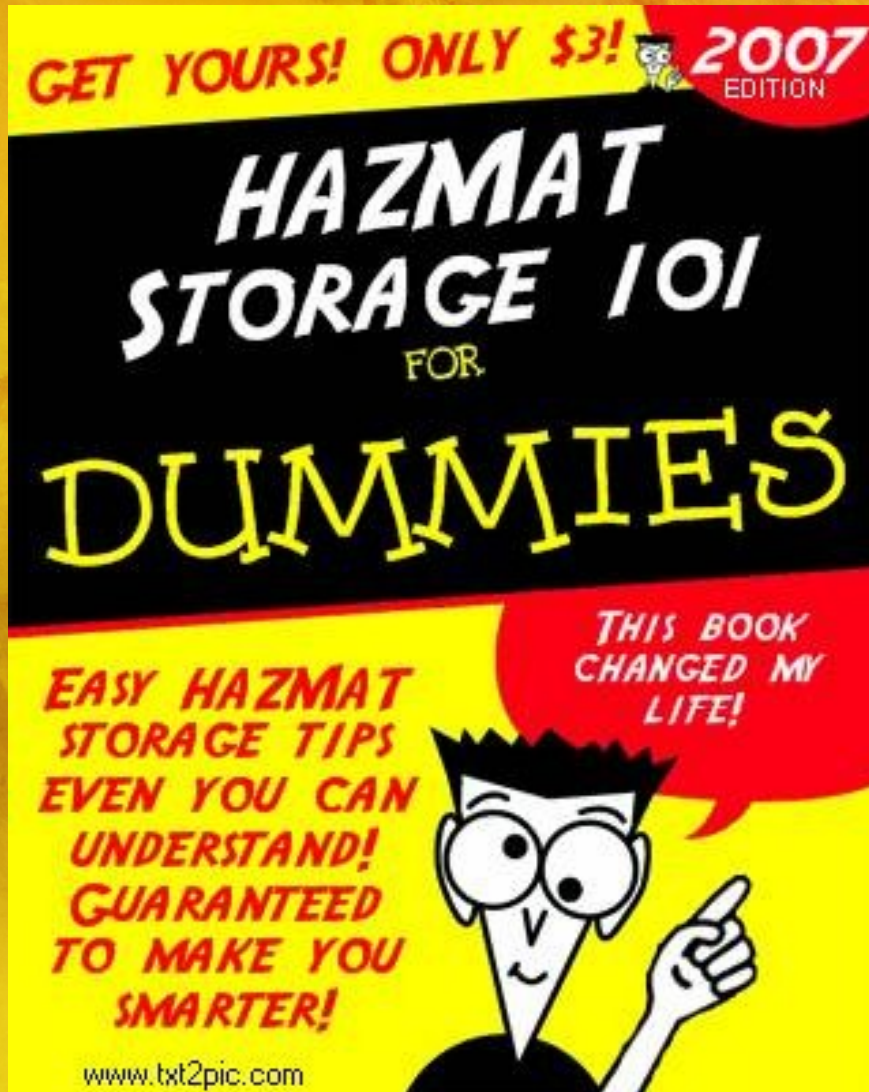
**Determine how to
properly store typical
Air Force Hazmats
(laboratories excluded)**

\$*#

**Help re
the m
comm
ESOH CAMP
findings**

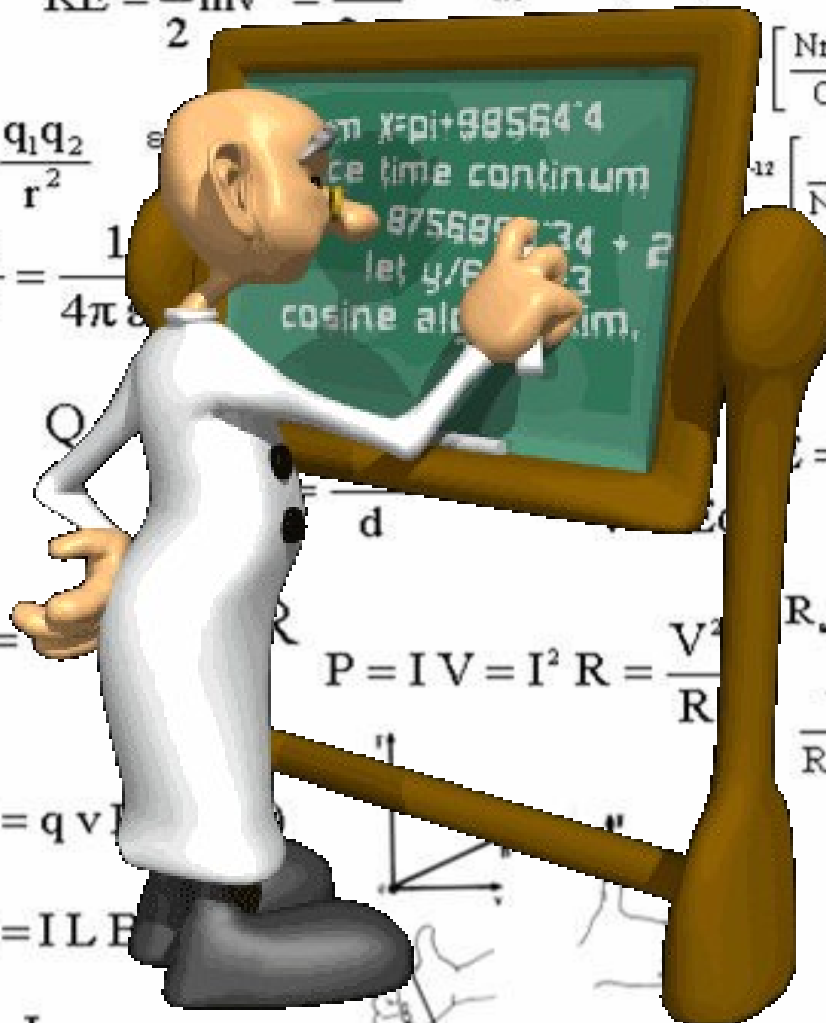


Who this will help...



- **HAZMART Operators and Shop Personnel who store Hazmats**
- **ESOH functionals, UECs, and others who inspect hazmat storage areas**

What we won't cover...



A 3D cartoon character, resembling a scientist or professor, stands in the center. He is bald, has a large nose, and is wearing a white lab coat with black buttons and black shoes. He is pointing his right index finger at a green chalkboard. The chalkboard has a wooden frame and a wooden stand. On the board, there is some faint, mostly illegible text that appears to be a mix of code and physics terms, including "x=pi+98564.4", "ce time continuum", "875685.34 + 2", "let y/6", and "cosine algo".

The background is a white surface covered with various physics equations and formulas, including:

- $\vec{F} = m \vec{a}$ $\vec{p} = m \vec{v}$ $KE = \frac{1}{2} m v^2 = \frac{p^2}{2m}$ $W_{tot} = \Delta(KE) = KE_f - KE_i$ $A_{\text{sphere-surface}} = 4\pi r^2$
- $\frac{mv^2}{R}$ $F = k \frac{q_1 q_2}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$ $E = k \frac{q}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$ $E = \frac{F}{q}$ $\sum_{\text{surf}} E_{\perp} \Delta A = \frac{q}{\epsilon_0}$ $\sum_{\text{junc}} I_j = 0$ $\sum_{\text{loop}} V_j = 0$ $P = IV = I^2 R = \frac{V^2}{R}$ $F = qvB_{\perp} = qv_{\perp}B = qvB\sin\theta$ $F = ILB_{\perp} = I_{\perp}LB = ILB\sin\theta$ $\sum B_{\parallel} \Delta l = \mu_0 I_{\perp}$
- $\left[\frac{Nm^3}{C^2} \right]$ $k = \frac{1}{4\pi\epsilon_0}$ $A_{\text{circle}} = \pi r^2$ $V_{\text{sphere}} = \frac{4}{3} \pi r^3$ $\sim e^{-t/RC}$ $\frac{U}{q} = \frac{\sigma}{\epsilon_0}$ $U = \frac{QV}{2} = \frac{CV^2}{2} = \frac{Q^2}{2C}$ $R_{\text{eff}} = R_1 + R_2$ $\frac{1}{C_{\text{eff}}} = \frac{1}{C_1} + \frac{1}{C_2}$ $\frac{1}{R_{\text{eff}}} = \frac{1}{R_1} + \frac{1}{R_2}$ $C_{\text{eff}} = C_1 + C_2$ $B = \frac{\mu_0 I}{2\pi r}$ $\mu_0 = 4\pi(10)^{-7} \text{ Tm/A}$

Have you ever felt.....



**...Like everyone is beating down
your door to inspect you?**

Types of Hazards

- There are two kinds of hazards according to OSHA 29 CFR 1910.1200, HAZCOM Standard
 - Dukes of Hazza
 - Health



- When we store materials, we are primarily concerned with **PHYSICAL HAZARD**

Physical Hazard

Book Definition

Physical hazard means a chemical for which there is scientifically valid evidence that it is a *combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.*
(29 CFR 1910.1200)

Compatible Storage



- Hazmats are stored by compatible **physical hazards** to avoid possible mixing that may cause....
 - toxic gases to be released
 - property damage
 - violent reactions
 - fire or explosions
 - personal injury or death

#1 Finding: Incompatible Storage

**What
da...?**



**Most folks just don't know how
to determine the physical hazard**

Physical Hazards

Typical Physical Hazards

- **Flammable**
- **Combustibles**
- **Corrosives**
- **Oxidizers**
- **Organic Peroxides**
- **Various Compressed Gases**

LEARN TO RECOGNIZE THE HAZARD!

Flammable and Combustibles

Flammables & Combustibles



- Most common hazard
- Several agencies define and classify flammable & combustible liquids
 - OSHA
 - NFPA
 - DOT
- AFOSH Stnd 91-501, Chapter 22 follows OSHA 29 CFR 1910.106 and NFPA 30

Flammables & Combustibles



**Flammability is
determined by
measuring a
substances
FLASH POINT**

Flammables & Combustibles

- Flammables and Combustibles are divided by class
- You must know the class of a material because there are storage quantity restrictions depending on the class
(quantities later...)



Flammables & Combustibles

Classification

Classification	Term	Flash Point and Boiling Point	Examples
Class IA	Flammable	Below 73°F Boils below 100°F	Ether Methane
Class IB	Flammable	Below 73°F Boils above 100°F	Acetone, MEK, Toluene, Benzene, Methanol, Ethanol, Gasoline
Class IC	Flammable	Above 73°F Boils below 100°F	Liquid Propane
Class II	Combustible	At or above 100°F	Diesel, JP-8, Hydrazine
Class IIIA	Combustible	At or above 140°F	JP-5
Class IIIB	Combustible	At or above 200°F	Hydraulic Fluid, Lube Oil

Flammables & Combustibles

T-210 THINNER, POLYURETHANE THINNER
MIL-T-81772B DATED 29 JAN 1986 TYPE I
FLAMMABLE LIQUIDS, n.o.s. (1-METHOXY - 2- PROPANOL ACETATE, METHYL ETHYL KETONE), 3, UN1993, II
WARNING: OVEREXPOSURE MAY CAUSE LUNG DAMAGE. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. VAPOR AND MIST HARMFUL. CAUSES IRRITATION. "FLAMMABLE"

SAFETY INSTRUCTIONS: KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. VAPORS MAY CAUSE FLASH FIRES. USE WITH ADEQUATE VENTILATION. DO NOT BREATHE VAPORS OR SPRAY MIST. WEAR AN APPROPRIATE, PROPERLY FITTED RESPIRATOR (NIOSH/MSHA APPROVED) DURING AND AFTER APPLICATION UNLESS AIR MONITORING DEMONSTRATES VAPOR/MIST LEVEL IS BELOW APPLICABLE LIMITS. AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

FIRST AID: IF SWALLOWED, INDUCE VOMITING BY GIVING TWO GLASSES OF WATER AND STICKING FINGER DOWN THROAT. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. GET MEDICAL ATTENTION. FOR EYE CONTACT, FLUSH WITH WATER FOR AT LEAST 15 MINUTES AND OBTAIN MEDICAL ATTENTION. FOR SKIN, WASH THOROUGHLY WITH SOAP AND WATER. FOR INHALATION, REMOVE TO FRESH AIR.

CAUTION: AVOID CONTACT WITH SKIN AND EYES. USE WITH ADEQUATE VENTILATION. FOR OTHER SAFETY RECOMMENDATIONS REFER TO THE MATERIAL SAFETY DATA SHEET. KEEP CONTAINERS TIGHTLY CLOSED.

INSTRUCTIONS FOR STORAGE: NO SPECIAL STORAGE PROCEDURES REQUIRED.

USE TO REDUCE AIRCRAFT COATINGS TO REQUIRED VISCOSITY

THE PRODUCT IS SOLD WITH A ONE YEAR WARRANTY, ASSURING THAT IT MEETS THE REQUIREMENTS OF THE SPECIFICATION. IF YOU HAVE A WARRANTY CLAIM PLEASE CONTACT GENERAL SERVICES ADMINISTRATION.

EMERGENCY CONTACT
800-431-6000 (24 HOURS)

Health	2
Flam.	3
React.	0
PPE	0

NCP
NCP Coatings Inc.
225 Fort Street
Niles, Michigan 49120 • 800-627-1948
www.ncpc coatings.com

09/03/2000

3

NOTICE
KEEP CONTAINER CLOSED WHEN NOT IN USE. IN CASE OF SPILLAGE, ABSORB WITH INERT MATERIAL AND DISPOSE OF PROPERLY.

BATCH # 100194
DATE OF MANUFACTURE: 5/03
REINSPECTION DATE: 3/08
FLASH POINT: 30 (38F)

FOR INDUSTRIAL USE ONLY

Bottom
Line: material
having a flash
point

below 100°F
call it

FLAMMABLE

at or above
100°F call it
COMBUSTIBLE

Flammables & Combustibles

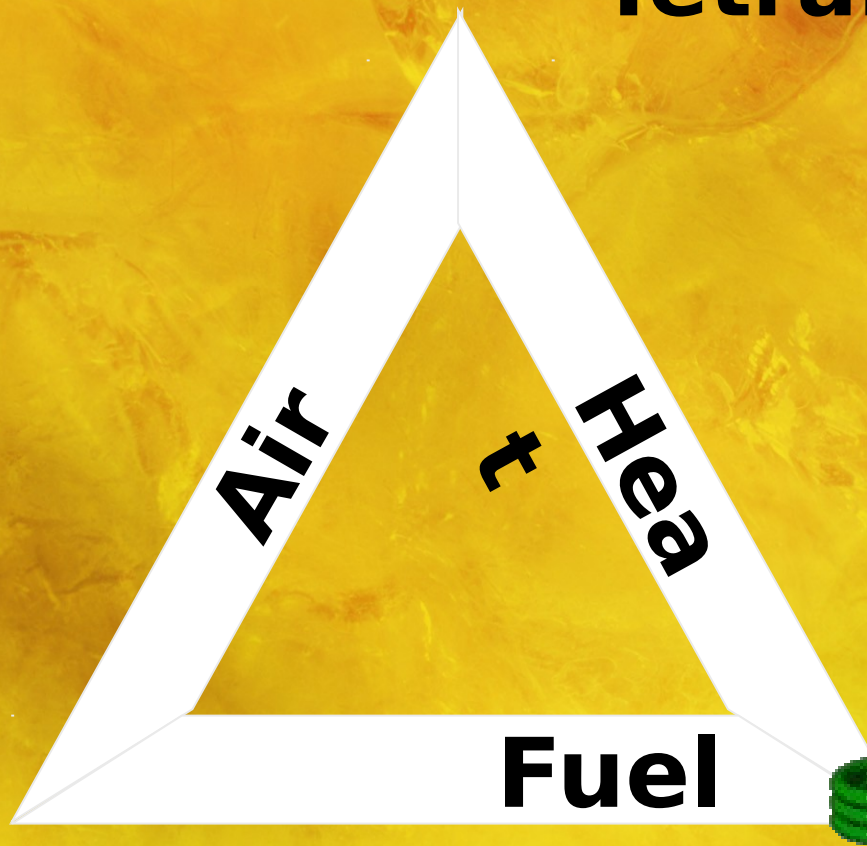


**This is not a
transportati
on class...**

**DOT sets
flammable
at 140°F**

Flammables & Combustibles

Fire Triangle or Tetrahedron



Oxygen - sustain
Combustion

Definition

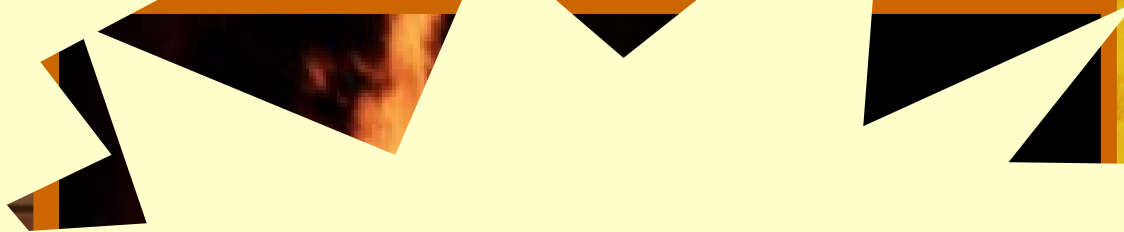
Source: raised material



Flame = chemical reaction

Flammables & Combustibles

**It's the vapors
stupid...it's the
vapors!**



Corrosives

Corrosives

**A corrosive material is a highly reactive substance that *causes obvious damage to living tissue*. Corrosives act either directly, by chemically destroying the part (oxidation), or indirectly by causing inflammation.
(29 CFR 1910.1200 Appendix A)**




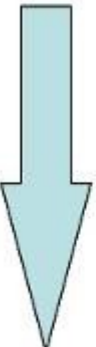
Book Definition

Corrosives

Both ends of
the pH scale
are
Corrosive...

...but high and
low pH's are
INCOMPATIBLE

also called Alkaline
or Caustic

Environmental Effects		pH	Examples
ACIDIC 		pH=0	Battery Acid
		pH=1	Sulfuric Acid
		pH=2	Lemon Juice, Vinegar
		pH=3	Orange Juice, Soda
	All Fish Die (4.2)	pH=4	Acid rain (4.2-4.4) Acidic lake (4.5)
	Frog Eggs, Tadpoles, Crayfish & Mayflies Die (5.5)	pH=5	Bananas (5.0-5.3) Clean Rain (5.6)
	Rainbow Trout Begin to Die (6.0)	pH=6	Healthy Lake (6.5) Milk (6.6-6.8)
		pH=7	Pure Water
		pH=8	Sea water, Eggs
		pH=9	Baking soda
NEUTRAL  BASIC		pH=10	Milk of Magnesia
		pH=11	Ammonia
		pH=12	Soapy water
		pH=13	Bleach
		pH=14	Liquid drain cleaner

Corrosives

Gang Colors



You can look at their colors and know what they are...

Corrosives

...Not a

SIVES!

Bo

the



CORROSIVE

You

Corros

of

oring!

**Just because the
mean they**

**label does not
same Gang!**

8

BASE



Typical AF Corrosive S

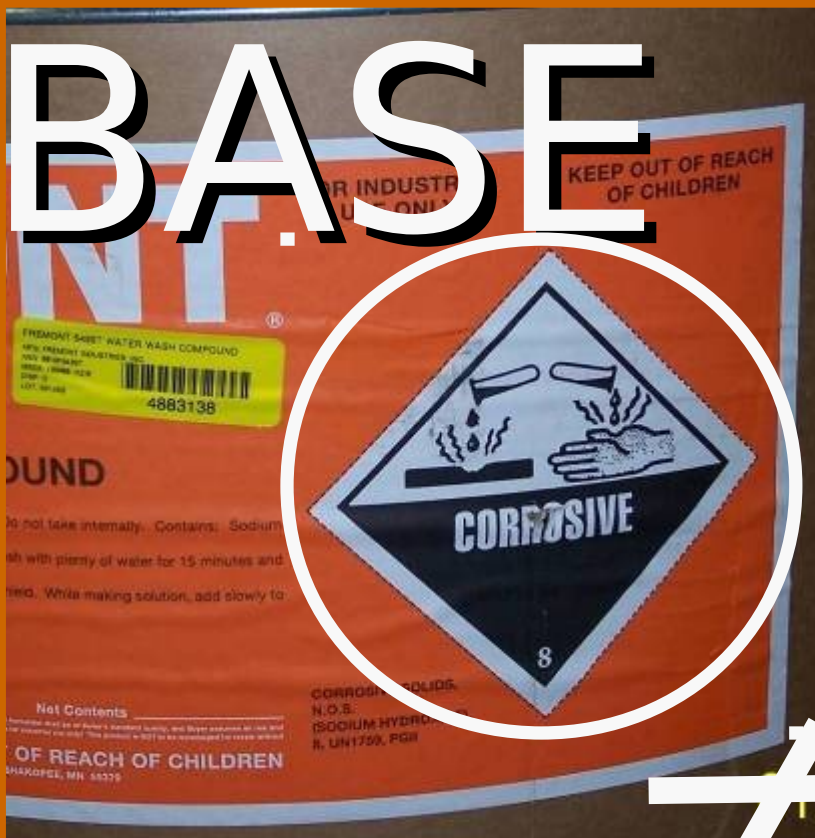


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ACID



01/05/2003



Typical AF Corrosive S

SULFURIC ACID 37% ELECTROLYTE GRADE LOT# SH011205AL

Do not get in eyes, on skin, or on clothing.
Do not breathe vapors or mist. Do not allow
water to get into the container since a
violent reaction may result.

FIRST AID: In case of contact with eyes,
immediately flush eyes with lots of running
water for 15 minutes, lifting the upper and
lower eyelids occasionally. Get medical
attention immediately.

NET: 1 GALLON BOTTLE
DOT Shipping Name: Battery Fluid, Acid
8, UN2796, PG II
ALLIANCE CHEMICAL
204 S. EDMOND ST.
TAYLOR, TEXAS 76574



6810002499354

CAGE: 1LTS6

1 GL.

SULFURIC ACID, ELECTROLYTE
SP0450-03-D-4026-023Z



SP045003D4026023Z

MHM - 01 / 05

WT: 11.2 LBS

MFD DATE: 01 / 05

EXP DATE: 01 / 10



8030-00-142-9272

CORROSION RESISTANT COATING-CHEMICALLY TREATED ALUMINUM
MIL-DTL-81706A & AMEND. 5

Cl. 1A-Form III,-Premixed Liq., Meth. B-Brush

QPL #NADC ltr 6062 SER 91638, Jul 70 (ALODINE 1201)

MFG: HENKEL SURFACE TECHNOLOGIES, 32100 STEPHENSON HWY, MADISON HGT, MI 48071

12 PT (FOR EMERGENCY - CHEMTREC: 800 424 9300)

RAIRUBE INC, 36977 FOX GLEN, FARMINGTON HILLS, MI 48331

SHIPPER: Rairube Inc., Bridgewater, MI 48115 (248 661 0280)

TC-GS-06F-L0010 PO #S-W-AB132-2M

LOT #W5D0516 DOM: 04/05 REINSP: (24 MO) 04/07

WT: 6.81 KG. (15 LB.) CU: .01 M (0.42 FT.)

CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S., (CONTAINS CHROMIC ACID,
HYDROFLUORIC ACID), 8, UN3384, PG II, DANGEROUS GOODS IN LIMITED QUANTITY

DO NOT FREEZE



Corrosive Liquid, Acidic, Inorganic, N.O.S.
(contains chromic acid, hydrofluoric acid)

Oxidizers

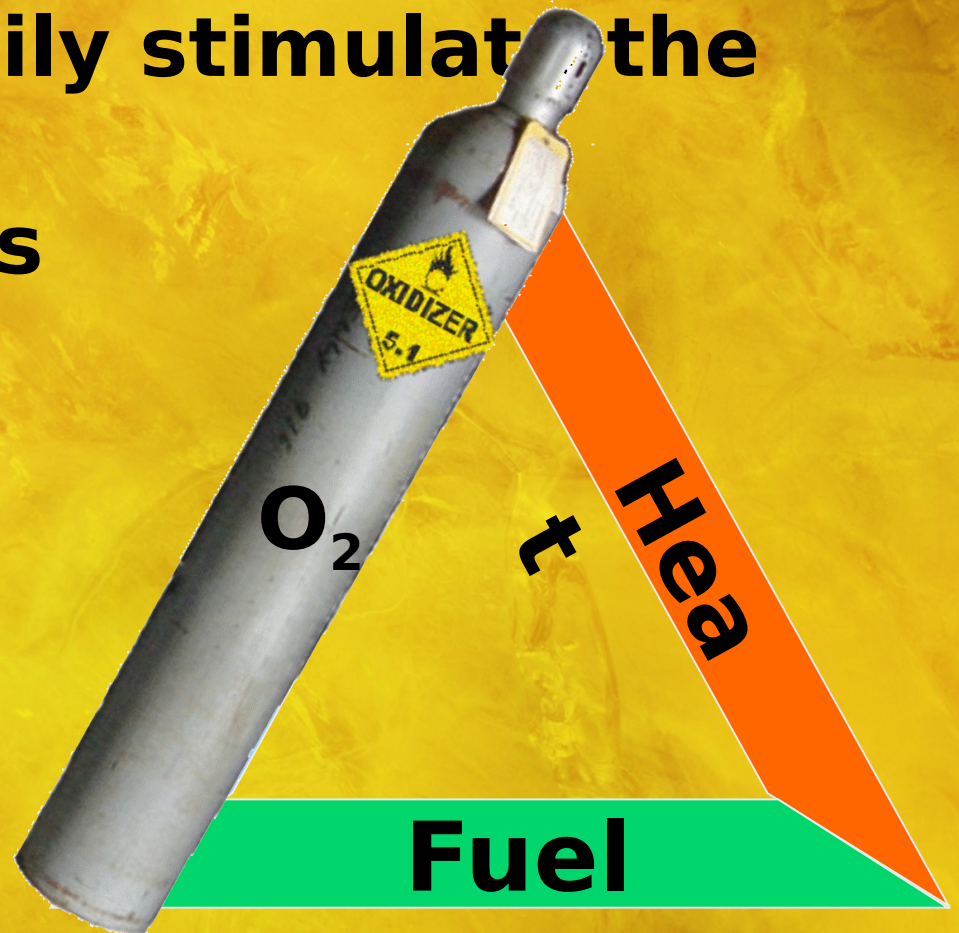
Oxidizers

Oxidizers are compounds which are capable of *reacting with and oxidizing other materials* (i.e., giving off oxygen).

Source: <http://safety.science.tamu.edu/oxidizers.html>

Oxidizers

- The primary hazard lies in their ability to act as an oxygen source, and thus to readily stimulate the combustion of organic materials



Oxidizers

**Oxidizer
Reactions**

nd

er

Oxidizers

Classification System for Oxidizing Materials

Class 4	An oxidizing material that can undergo an explosive reaction when catalyzed or exposed to heat, shock or friction.	Hydrogen Peroxide (>91% concentration) Ammonium Perchlorate
Class 3	An oxidizing material that will cause a severe increase in the burning rate of combustible material with which it comes in contact or will undergo vigorous self-sustained decomposition when catalyzed or exposed to heat.	Calcium Hypochlorite (>51% by weight)
Class 2	An oxidizing material that will moderately increase the burning rate or which may cause spontaneous ignition of combustible material with which it comes in contact.	Chromium Trioxide (Chromic acid) Potassium Permanganate
Class 1	An oxidizing material whose primary hazard is that it may increase the burning rate of combustible material with which it comes in contact.	Nitric Acid <70% Strontium Chlorate

established by the National Fire Protection Association (NFPA 430, 2004) as a means to provide information on safe storage of liquid and solid oxidizing materials

Organic Peroxides

Organic Peroxides

An organic peroxide is any organic (carbon-containing) compound having two oxygen atoms joined together (-O-O-). This chemical group is called a "peroxy" group.

Organic peroxides can be severe fire and explosion hazards.

- May also be toxic and corrosive
- Strong Oxidizing agents

Source: http://www.ccohs.ca/oshanswers/chemicals/organic/organic_peroxide.html

Organic Peroxides

- Primary hazard is that these hazmats have two of the three sides of the fire triangle: fuel (carbon) and O_2 in the compound

- On contact, shock

materials to

are
ed



Organic Peroxides



- Most common used by the Air Force: Methyl Ethyl Ketone Peroxide (MEKP)
 - Keep cool
 - Do not extend shelf life - dispose of when expired
 - Do Not Over Order
 - Disposal may be expensive
 - Look for alternatives

Compressed Gas

Compressed Gas

- **Classifications**

- flammable
- non-flammable
- oxygen
- **Poison**

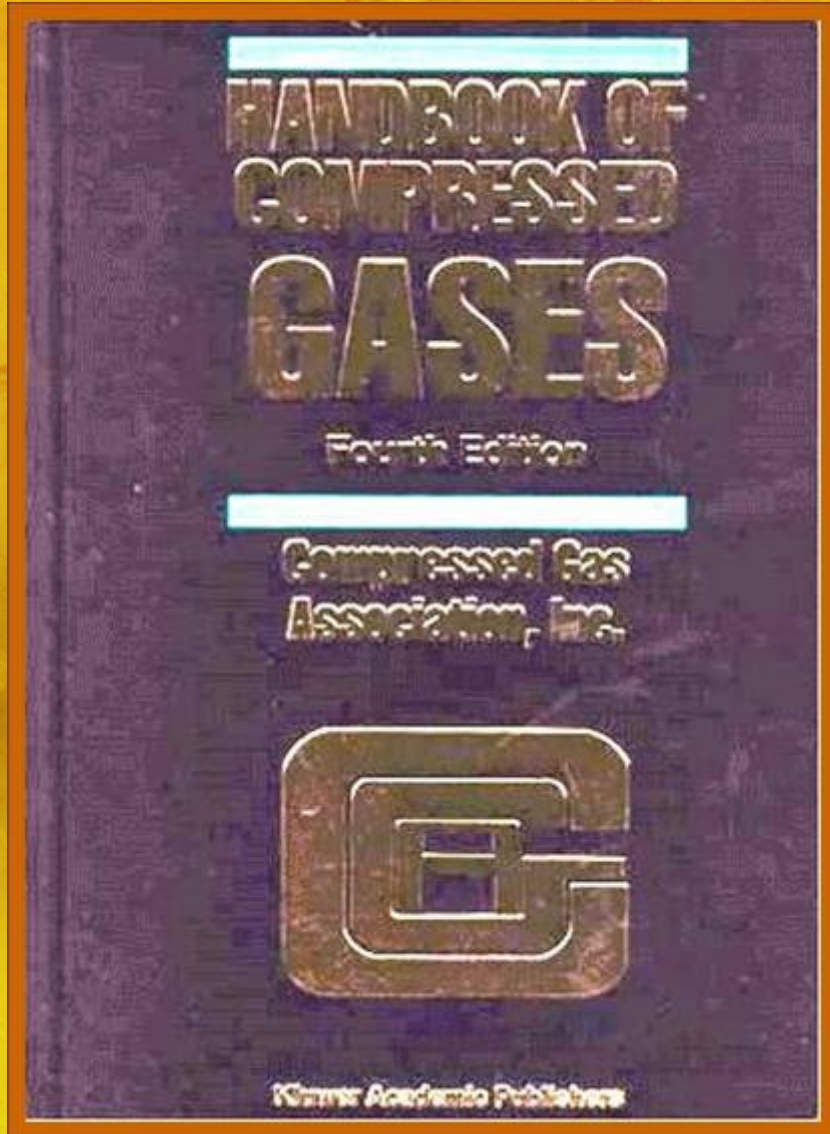
- **Types**

- Liquefied
- Dissolved
- Cryogenic



Compressed Gas Association is at
<http://www.cganet.com>

Compressed Gas



- **OSHA 29 CFR 1910.101(a) refers to the Compressed Gas Pamphlet published by the Compressed Gas Association**
- **Available on-line**
- **NOT Free**

Compressed Gas

- **Just because a gas is non-flammable does not mean it is not hazardous**
 - **Nitrogen**
 - **Argon**
 - **Helium**
 - **Carbon dioxide**
 - **Liquid carbon dioxide**

Compressed Gas Oxygen

- **Oxygen is an oxidizer!**
 - Will accelerate burning of ignited materials
 - Will even make some materials burn violently in an oxygen-enriched atmosphere even if they do not under normal conditions
- **Keep combustibles and ignition sources away from areas where oxygen is used or stored.**



Compressed Gas

Compressed air is a potentially deadly

non-flammable gas because:

- Under pressure it supports and will accelerate burning
- As little as 10 pounds per square inch (psi) of compressed air entering a cut or body opening can cause death
- NOTE: Substituting pure oxygen for compressed air in supplied-air respirators can cause explosions



Compressed Gas

Flammable Gas

- **Highly flammable when mixed with air. Just a spark**
 - **Hydrogen**
 - **Propane**
 - **Butane**
 - **Acetylene**



Compressed Gas

Handling &

Storage

- Marked with a color-coded, diamond-shaped label and a written warning label which includes the material's name, hazards and safety precautions
- Cylinders should be stored on end on a smooth floor. All cylinders should be chained or otherwise fastened firmly against a wall, post, or other solid object



Compressed Gas

Handling & Storage

- **Empty cylinders must be stored apart from full cylinders**
- **Group cylinders according to their hazard classification**
- **Store fuel-gas cylinders at least 20 feet away from oxidizers**
- **Storage should be set up away from heavy traffic**
- **Never leave cylinders outside in direct sunlight or near other sources of heat**

Compressed Gas

Transporting/moving cylinders



Use a special dolly that does not allow excessive movement, sudden or violent contacts to help prevent injury to yourself or damage to cylinder



Compressed Gas

Transporting/moving cylinders



- For short distance moving, a cylinder may be rolled on its bottom edge, but never dragged
- Cylinders should never be dropped or permitted to strike one another

NOTE: Do not use a forklift to move cylinders

Picture from

Compressed Gas

Valves & Caps

- **Never force valve connections**
- **Always open a valve slowly and point it away from yourself and others**
- **NEVER use the valve or cover to move or lift the cylinder**
- **Check that all valves are closed before moving a cylinder**
- **Protective caps must be kept on valves when not in use**



Compressed Gas

LP Gas Tanks (NFPA 58, page 58)

Public-Frequented Buildings:

- Max 200 lbs stored in one location

Non Public-Frequented Buildings:

- Max 735 lbs stored in one location
- 300 ft separation of storage areas on same floor

Outdoor Storage:

- At least 5 ft from any doorway or opening in a building frequented by the public with two means of egress
- At least 10 ft from any doorway or opening in a building or sections of a building with only one means of egress
- At least 20 ft from any vehicle service station fuel dispenser



Compressed Gas

Small Compressed Gas Containers

Do not store small compressed gas bottles in flammable lockers with other flammables

https://www.denix.osd.mil/denix/Public/News/AF/Frontiers/V3_3/v3i3.html
article by Dan Dresser, HQ AFSPC/CEVC

Store flammable aerosol cans on a dedicated shelf

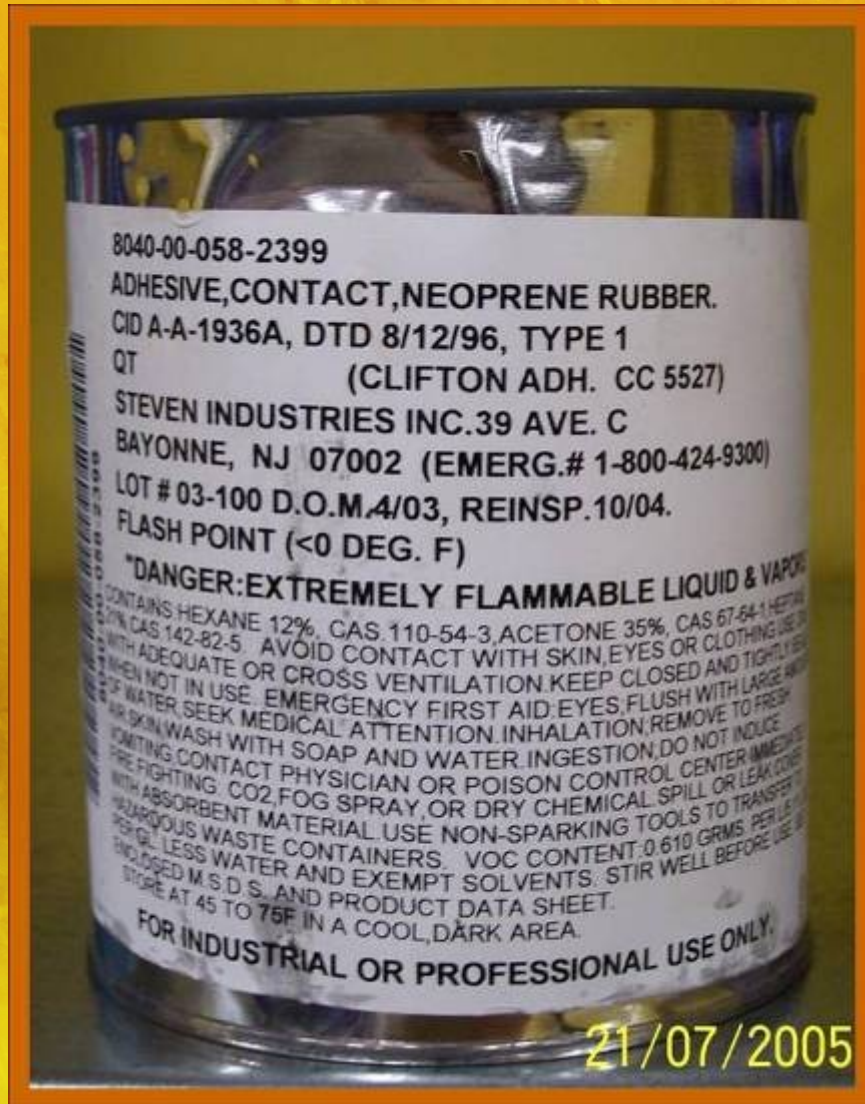


Determining the Physical Hazard



So How do I
determine
the Physical
Hazard of a
material?

First: Read the Label



**OSHA requires
labels communicate
“appropriate
hazard warnings”
29 CFR 1910.1200(f)(1)(ii)**

First: Read the Label

0-238
OE/HDO-30
LUBRICATING OIL, ENGINE
MIL-PRF-2104G
9150-01-178-4726
PITT PENN OIL CO.
DATE OF MANUFACTURE APRIL 2003
TEST DATE APRIL 2006
NEW TEST DATE
MC-3835
1QT



**What if the
hazard isn't
on the label?**

Second: Read the MSDS

- **MSDSs unfortunately do not have a section that clearly states the Physical Hazard**
- **You must INTERPRET the data!**



Interpreting MSDSs



- **Fire Section**
 - Flash Point
- **Physical Properties Section**
 - pH
- **Handling and Storage**
- **Stability**
 - Incompatibles

MSDS: Fire Section

SECTION 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

Autoignition temperature

No Data Available

Flash Point

-42.00 °F [Test Method: Tagliabue C

Flammable Limits - LEL

No Data Available

Flammable Limits - UEL

No Data Available

OSHA Flammability Classification:

Class 1A Flammable Liquid

What is
the Flash
Point?

5. FIRE FIGHTING MEASURES

FLASH POINT (method): 435 deg F (COC)

FLAMMABLE LIMITS

LOWER EXPLOSION LIMIT: 0.9 %

UPPER EXPLOSION LIMIT: 7.0 %

FLAMMABILITY CLASS: None

EXTINGUISHING MEDIA: Foam, Dry Chemical, Carbon Dioxide
(Fog)

What is
the Flash
Point?

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

What is the pH?

Color, Color, Grade:	Clear viscous liquid, water white to pale straw color.
General Physical Form:	Liquid
Flash Point	No Data Available
Ignition temperature	No Data Available
Flash Point	-6 °C [Test Method: Closed Cup]
Flammable Limits - LEL	No Data Available
Flammable Limits - UEL	No Data Available
Boiling point	76 °C
Density	1.0 g/ml
Vapor Density	3.1 [Ref Std: AIR=1]
Vapor Pressure	73 mmHg [@ 20 °C]
Specific Gravity	1.0 [Ref Std: WATER=1]
pH	Not Applicable
Melting point	Not Applicable

Verification: None required.

Section IX- Physical and Chemical Properties:

pH: 11.85 - 11.95 Specific Gravity: 1.014 @ 25 °C

Solubility in Water: 100% Boiling Point: 208°F

Appearance and Odor: Pale yellow/Clear liquid, faint odor Freezing Point: 30°F (-1°C)

Section X- Stability and Reactivity:

Physical Hazards: None suspected, identified or known. Stability Status: Stable

Hazardous Polymerization: Will not occur. Physical Hazards: None identified.

Incompatibility: Strong Acids; reactive metals; electrically energized equipment; any materials reactive with water.

Remember
alkalines do
not mix with
acids!

Third: Other Markings HMIS® vs. NFPA

HMIS®

- National Paint and Coatings Association (NPCA)**
- HMIS® is a registered mark of the NPCA**
- HMIS® III changes**

NFPA

- National Fire Protection Association**

HMIS® attempts to convey full health warning information to all employees while NFPA is meant primarily for fire fighters and other emergency responders

NFPA & HMIS® Labeling

- Not found on all MSDSs
- Not a definitive source for the Physical Hazard...but still a clue
- HMIS® Label
- NFPA Label



HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HAZARD INDEX

4 = SEVERE HAZARD
 3 = SERIOUS HAZARD
 2 = MODERATE HAZARD
 1 = SLIGHT HAZARD
 0 = MINIMAL HAZARD

* An asterisk (*) or other designation corresponds to additional information on data sheet or separate sheets effects notification.

HEALTH	<input type="checkbox"/>	<input type="checkbox"/>
FLAMMABILITY	<input type="checkbox"/>	
PHYSICAL HAZARD	<input type="checkbox"/>	
PERSONAL PROTECTION		

PERSONAL PROTECTION INDEX

A		G	+ +										
B	+	H	+ + +										
C	+ +	I	+ +										
D	+ +	J	+ + +										
E	+ +	K	+ + +										
F	+ + +	X	Consult your supervisor or S.O.P. for "SPECIAL" handling directions										
A		n		o		p		q		r		s	
Safety Glasses	Optical Goggles	Face Shield & Eye Protection	Gloves	Boots	Synthetic Apron	Full Suit							
t		u		w		y		z		Additional Information			
Respirator	Dust & Vapor	Full Face	Airline Hood										

Change from Protective Equipment to Physical Hazard

IMPORTANT! READ MATERIAL SAFETY DATA SHEET!

shown on MSDS

APPROPRIATE HAZARD WARNINGS

HEALTH HAZARDS

☐ TOXIC ☐ CORROSIVE
☐ HIGHLY TOXIC ☐ SENSITIZER
☐ REPRODUCTIVE TOXIC ☐ CARCINOGEN
☐ IRRITANT ☐ _____

IMMEDIATE & DELAYED TARGET ORGAN EFFECTS

☐ HEPATOTOXINS: LIVER DAMAGE, JAUNDICE, LIVER ENLARGEMENT ☐ HEMATOPOIETICS: BLOOD DAMAGE, CYANOSIS, UNCONSCIOUSNESS
☐ NEPHROTOXINS: KIDNEY DAMAGE, EDEMA, PROTEINURIA ☐ PULMONARY DYSFUNCTIONS: LUNG DAMAGE, SHORTNESS OF BREATH, CHEST TIGHTNESS, COUGH
☐ NEUROTOXINS: NERVOUS SYSTEM DAMAGE, NARCOSIS, BEHAVIORAL CHANGES, DECREASE IN MOTOR FUNCTIONS ☐ REPRODUCTIVE TOXINS: BIRTH DEFECTS, STERILITY

ROUTES OF ENTRY

☐ INGESTION ☐ INHALATION ☐ SKIN ABSORPTION ☐ SKIN OR EYE CONTACT ☐ _____

PHYSICAL HAZARDS

☐ COMBUSTIBLE LIQUID ☐ UNSTABLE (REACTIVE) ☐ EXPLOSIVE
☐ COMPRESSED GAS ☐ OXIDIZER ☐ FLAMMABLE LIQUID/SOLID
☐ ORGANIC PEROXIDE ☐ FLAMMABLE GAS ☐ PYROPHORIC
☐ WATER REACTIVE ☐ _____

HEALTH
FLAMMABILITY
PHYSICAL HAZARD
PERSONAL PROTECTION

RATINGS: 4 = SEVERE, 3 = SERIOUS, 2 = MODERATE, 1 = SLIGHT, 0 = MINIMAL HAZARD

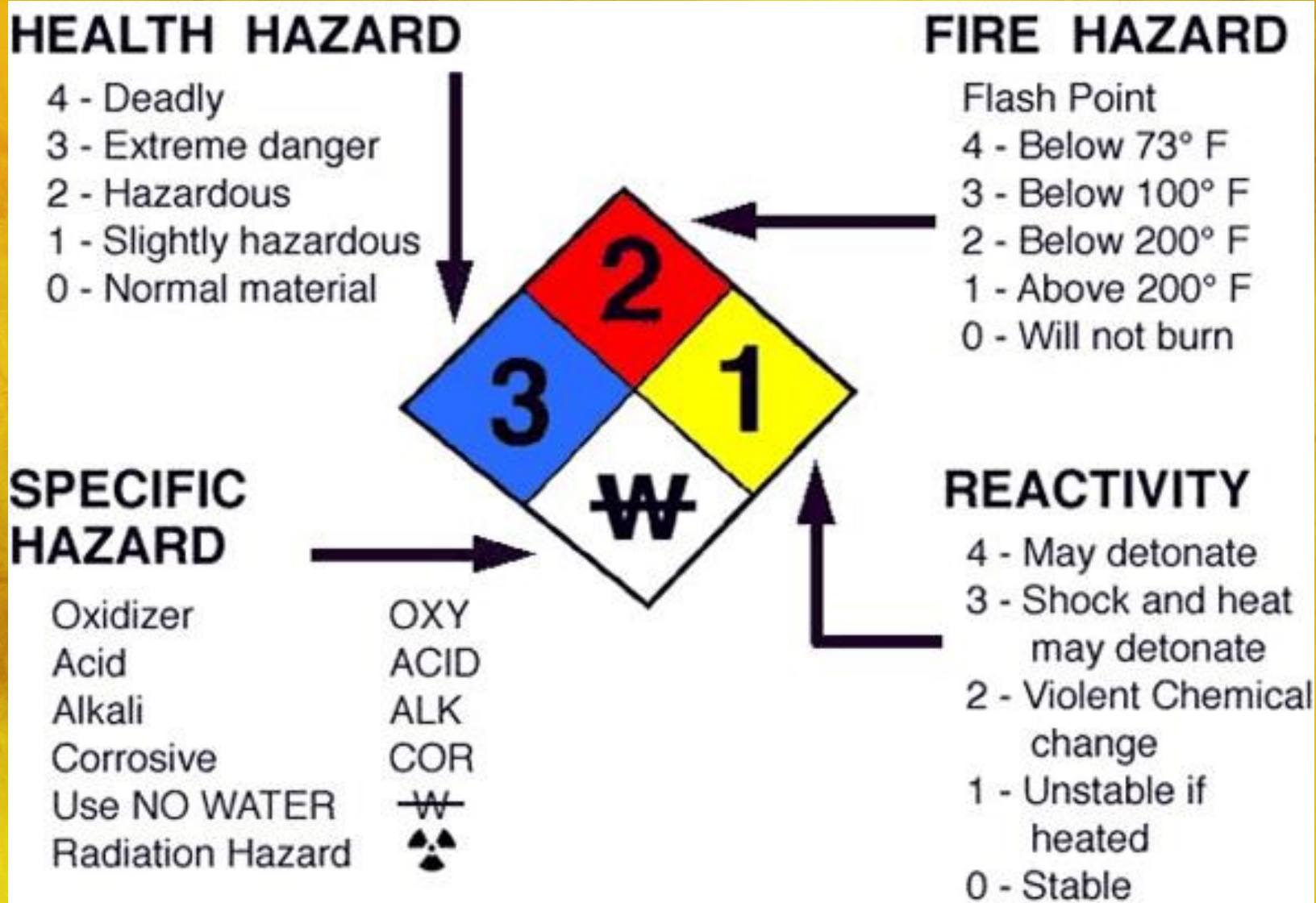
☐ CUTANEOUS HAZARDS: SKIN DAMAGE, FLASHES, IRRITATION, DEFATTING OF SKIN
☐ EYE HAZARDS: IMPAIRED VISION, CONJUNCTIVITIS, CORNEAL DAMAGE

COMPANY NAME
ADDRESS
CITY, STATE, ZIP

HMIS® 02/95 NPCA • Printed by J/JKA • Neenah, WI • 1-800-327-6868 339-HMI-R 6919

Physical
Hazard

NFPA Special Hazards



NFPA & HMIS Info on MSDSs

No consistent display of info

NFPA
&
HMIS

MATERIAL SAFETY DATA
Sikabond® Construction Adhesive

HMIS	
HEALTH	2
FLAMMABILITY	1
REACTIVITY	0
PERSONAL PROTECTION	C

1. Product And Company Identification

Supplier	Manufacturer
Sika Corporation	Sika Corporation

HMIS

Use a self-contained breathing apparatus (SCBA) and protective clothing as recommended.

NFPA
HMIS

Health 1
Health 1

Flammability 1
Flammability 1

Reactivity 0
Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

HMIS or NFPA?

Chemical Name: Inorganic acids in water

Product Use: Tile and vinyl cleaner for pool and spa surfaces.

Hazard Rating

4 Extreme

3 High

2 Moderate

1 Slight

0 None

Designation

Health

Fire

Reactivity

Personal Protection

3

0

1

D

Section II - Hazardous Ingredients

<u>Material</u>	<u>% By Weight</u>	<u>CAS Nr</u>	<u>Exposure Limits</u>	<u>LD₅₀ (Oral-Rat)</u>
Sulfuric acid	15 – 25	7664-93-9	1 mg/m ³	2218 mg/Kg
Hydrochloric acid	15 – 25	7647-01-0	5 ppm	900 mg/Kg
Phosphoric acid	7 - 15	7664382	3 mg/m ³	1530 mg/Kg

Who you gonna call?



**When you just
need a little
help or
reassurance
about a
decision on
how to store
or handle
HAZMATs**

**CALL YOUR
TEAM!**

HMMP Team

- **Environmental Management**
- **Bioenvironmental Engineering**
- **Safety**
- **Fire and Emergency Services**



Flammable Storage Lockers

Flammable Storage Cabinets



**2nd Most ESOHCAMP
findings**

Cabinet & Material Limits

- Not more than 120 Gallons of Class I (A, B, or C), Class II, and Class IIIA liquids may be stored in a storage cabinet



- The combined total of Class I (A, B, or C) and Class II liquids may not exceed 60 gallons per storage cabinet
 - Increased number of smaller cabinets can be used but you may not exceed the gallons specified
- Not more than three such cabinets (120 gallons each) may be located in a single fire area except in an

Markings



- Cabinets will be labeled with conspicuous lettering,

**FLAMMABLE
KEEP FIRE AWAY**

**Wording is
non-
negotiable!**

To Vent or not to Vent?

- Not required but..
- If vented - vent to outdoors
- If not vented - leave bungs IN



Inside of Cabinet

Misc Locker Requirements

- **Construction requirements**
 - **Door latch**
 - **Retrofitting lockers**
 - **Must meet the specification requirements stated in AFOSH 91-501**
 - **Not recommended!**
 - **2 inch raised sill**
 - **Common finding: Users leave bottom shelf on floor of locker negating the 2" raised sill**
 - **Do NOT alter the locker by drilling holes such as to add additional security**

Resources

- **Got One hanging on your wall?**
- **Great resourceif you took it off the wall and actually used it!**



DLA Instruction 4145.11, 13 Jan 99

- **Storage and Handling of Hazardous Materials**
- **Joint regulation (AFJMAN 23-209) for storing hazardous materials. This manual contains technical know-how for**
- **storage of hazmats, intended for warehouse (HAZMART) personnel. Excellent resource for understanding the physical hazards of hazmats and how to properly segregate them.**

DLAI 4145.11
TM 38-410
NAVSUP PUB 573
AFJMAN 23-209
MCO 4450.12A

DLSC-LDD

13 Jan 99

STORAGE AND HANDLING OF HAZARDOUS MATERIALS

[This publication has been revised significantly and must be reviewed in its entirety.

See <http://www.dlaps.hq.dla.mil/i414511.pdf>]

AFOSH STD 91-501, 7 Jul 04

Flammable and Combustibles Chapter 22

306

AFOSHSTD91-501 7 JULY 2004

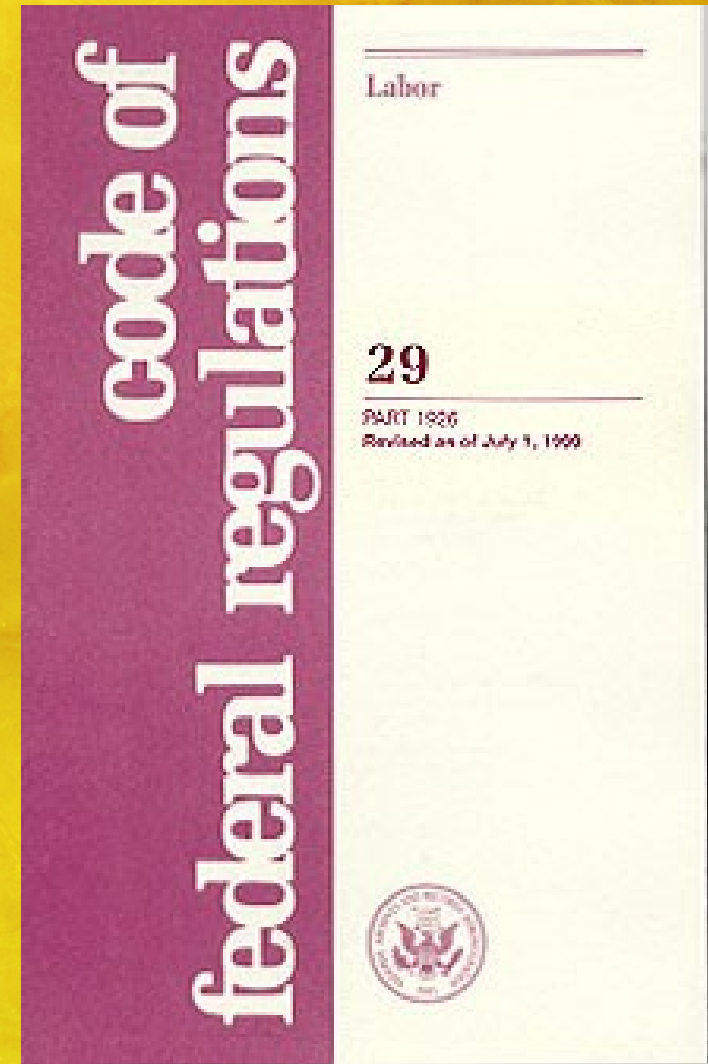
Chapter 22

FLAMMABLES AND COMBUSTIBLES

22.1. General Information. This chapter addresses key flammable and combustible liquids criteria, references other Air Force directives that cover specific aspects of flammable and combustible liquids storage, use, and handling, and implements pertinent portions of regulatory Occupational Safety and Health Administration (OSHA) Standard Title 29 Code of Federal Regulations (CFR) 1910.106, *Flammable and*

29 Code of Federal Regulations (CFR)

- **1910.110** -Storage and handling of liquefied petroleum gases
- **1910.111** - Storage and handling of anhydrous ammonia
- **1910.156** - Fuel handling and storage
- **1910.106** - Flammable and combustible materials
- **1910.176** - Handling materials - general



Chemical Hazards Response Information System (CHRIS)

- **The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional Response Teams for devising, evaluating, and carrying out response plans**
- **Includes compatibility chart**
- **List of Synonyms**
- **<http://www.chrismanual.com/Default.htm>**



Pictures

Housekeeping



Paper & Cardboard in Flam Cabinets



Obscuring Labels



Be careful not to put a label over information on the container that makes it non-Hazcom compliant

Improper Storage



[illegible]

Improper Storage



Improper Cylinder Storage



Compressed Gas



Batteries in Food Frig



Leaking Packages - Outside



Sloppy - Poor Housekeeping



This isn't Water!



Bottles
says
“DON'T
DRINK”

Incompatibles



Leaking Containers



Good Flammable Locker?



Good Job



Tag

Creative Labeling

Sloppy



Housekeeping



Batteries - poor storage



Mixed Corrosives



Shelf Life



June 1952!

Unlabeled Squirt Bottles



Mixed Storage



Indoor Storage



Indoor Storage



Unlabeled Containers



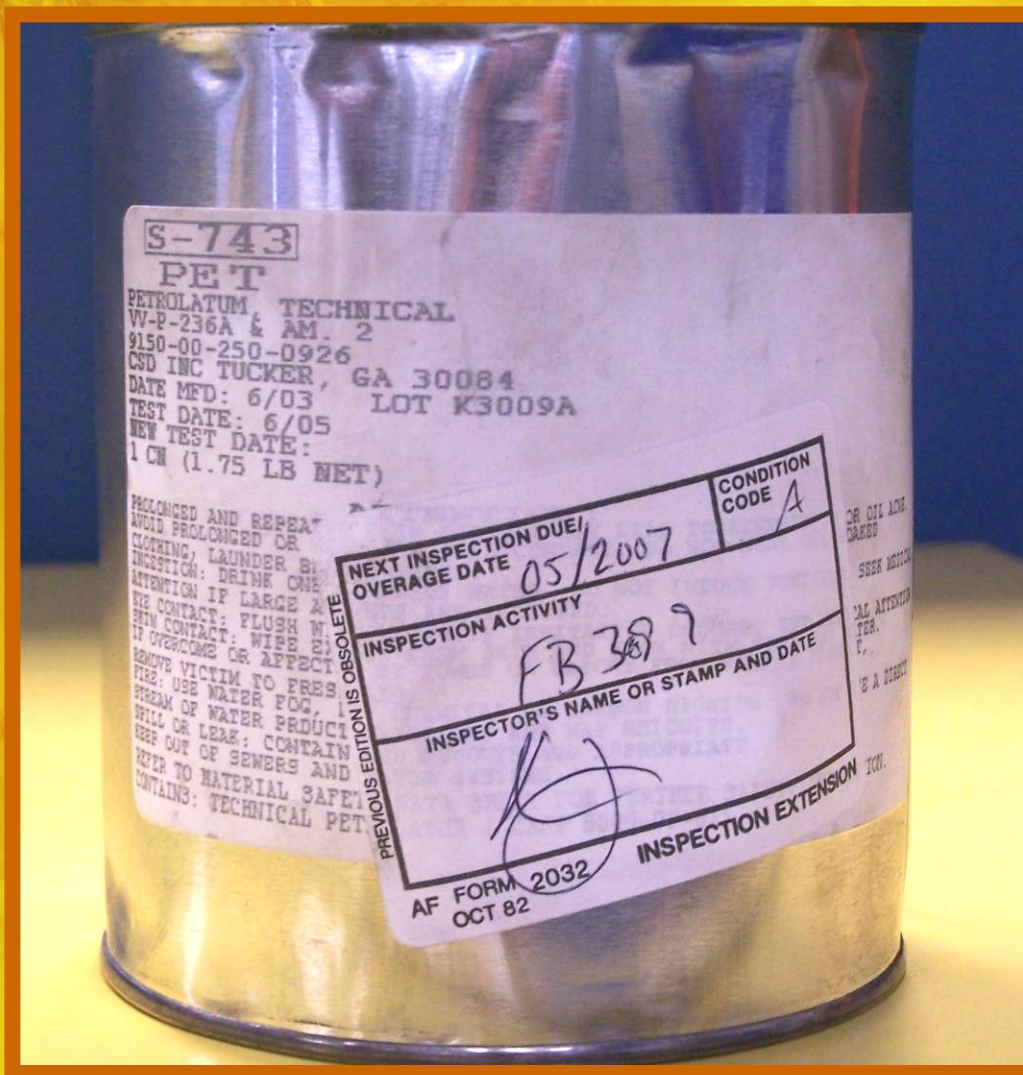
Consider the human element...



Meets regulation



Things that make you go hmmmm...



Use storage you have...



Perfect?



Cool!



Don't forget Spill Prevention

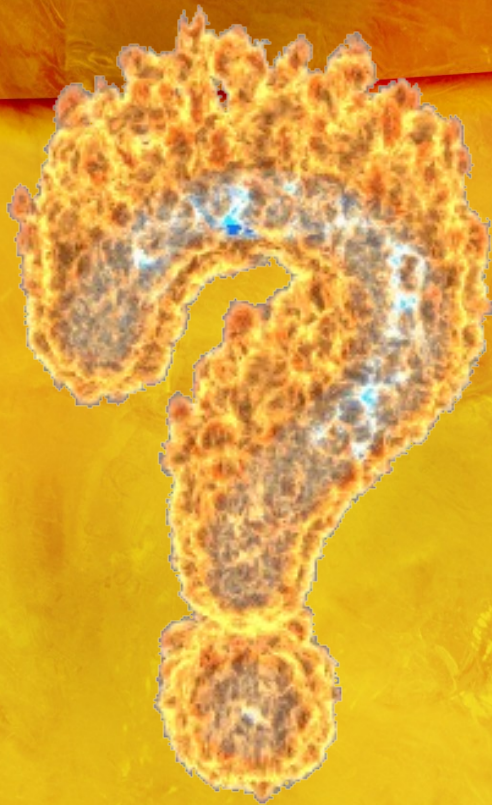


Making the most of shelf life...



OMG!





**Any... burning...
Questions?**